

SUMMARY OF GLOBAL LIFE CYCLE INVENTORY DATA RESOURCES

by
Mary Ann Curran
and
Philippa Notten, Co-Chairs

With Contributing TF1 Members: Julie-Ann Chayer and Gyorgyi Cicas

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Abstract

This report provides an overview of the available Life Cycle Inventory (LCI) databases around the world (including public, as well as proprietary, or restricted-access, databases). In doing so, the report provides insight into the current global status of LCA. The report is an update of a previous summary prepared in May 2002. The report meets a preliminary deliverable of Task Force 1 (Database Registry) of the SETAC/UNEP Life Cycle Initiative, and is planned to be further updated upon receipt of other deliverables from the Task Force.

The report includes a description of activities that aim to develop publicly-available databases in Africa, the APEC region and Asia, Europe, and the Americas (Canada, USA and Latin America). Because of their close association with the distribution of LCI data, LCA software programs that contain inventory data are also included in this effort. The report also lists institutions or organisations that provide LCI data in a less formal way, as this is important to get a feel for the global spread of LCI data. Also with the aim of facilitating access to global LCI data resources, the report provides contact details and information on regional LCA networks and societies. The focus of the report is on LCI databases and LCI data providers, therefore, it does not list general environmental or process data sources (i.e. data must be in the form of life cycle inventories).

Some sections of the original version of this report were paraphrased from a report of the SETAC Working Group on Data Quality and Data Availability. Information was also provided by proceedings of the APEC/AIST Symposia on LCA for APEC member economies, and by summaries of LCA activity in Asia published in the *International Journal of LCA*. The listing of industry/proprietary databases is partly from an initial "call for interest" in the database registry initiative of the UNEP/SETAC Life Cycle Initiative, and partly from research within Task Force 1 (notably using information from the US EPA's LCAccess web-resource and a report from CIRAIG).

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CONTENTS

	Page
1 INTRODUCTION	1
2 PUBLICLY-AVAILABLE DATABASE DEVELOPMENT EFFORTS AT THE NATIONAL LEVEL.....	2
2.1 AFRICA.....	2
2.2 APEC REGION AND ASIA	2
- JAPAN.....	3
- AUSTRALIA.....	3
- KOREA	3
- TAIWAN.....	3
- INDIA.....	3
- THAILAND.....	4
- OTHER.....	4
2.3 EUROPE.....	4
- GERMANY	4
- SWEDEN.....	5
- SWITZERLAND.....	5
- OTHER.....	5
2.4 AMERICAS.....	6
- CANADA.....	6
- USA	6
- LATIN AMERICA.....	6
REFERENCES	15
ACRONYMS.....	17
APPENDIX: BRIEF DESCRIPTIONS	19

LIST OF TABLES

Table 1: GLOBAL ACTIVITY IN THE PRODUCTION OF LCI DATA.....	7
Table 2: LCA ORGANISATIONS.....	8
Table 3: AVAILABLE NATIONAL LCI DATABASES.....	9
Table 4: INDUSTRY ORGANISATION DATABASES	11
Table 5: OTHER SOURCES OF LCI DATA	12
Table 6: LCI SOFTWARE	13

1 INTRODUCTION

This report provides an overview of the available Life Cycle Inventory (LCI) databases around the world, and also aims to capture the current global status of LCA. The report is an update of a previous summary prepared in May 2002 [1]. The report meets a preliminary deliverable of Task Force 1 (Database Registry) of the SETAC/UNEP Life Cycle Initiative, and is planned to be updated once further deliverables of the Task Force are met (i.e. once a first round of results of the online database questionnaire is available).

This summary identifies LCI databases including public, as well as proprietary, or restricted-access, databases. It includes descriptions of activities that aim to develop publicly-available databases in Africa, the APEC region and Asia, Europe, and the Americas (Canada, USA and Latin America). Because of their close association with the distribution of LCI data, LCA software programs that contain inventory data are also included in this effort. The report also lists institutions or organisations that provide LCI data in a less formal way, as this is important to get a feel for the global spread of LCI data. Also with the aim of facilitating access to global LCI data resources, the report provides contact details and information on regional LCA networks and societies. The focus of the report is on LCI databases and LCI data providers. It therefore does not list general environmental or process data sources (i.e. data must be in the form of life cycle inventories), nor does it list institutions working solely with LCA methodology development.

Some sections of the original version of this report were paraphrased from a report of the SETAC Working Group on Data Quality and Data Availability [2]. Information was also provided by proceedings of the APEC/AIST Symposia on LCA for APEC member economies, e.g., [3], and by summaries of LCA activity in Asia published in the *International Journal of LCA* [4-6]. The listing of industry/proprietary databases is partly from an initial "call for interest" in the database registry initiative of the UNEP/SETAC Life Cycle Initiative, and partly from research within Task Force 1 (notably using the US EPA's LCAccess web-resource [7] and CIRAIG's report [8]).

The LCI data resources are summarised in a series of tables. Table 1 provides an overview of the global spread of LCI data resources, and essentially provides a top-level summary of the subsequent tables, whilst Table 2 lists LCA societies and networks. LCI databases are listed in Tables 3, 4 and 5, with national database projects listed in Table 3, industry databases listed in Table 4 and all others listed in Table 5. Table 5 provides a listing of less formally available LCI data sources, and is primarily included for those data providers that responded to the "call for interest" in the database registry, but who cannot appropriately be listed in Tables 3 or 4. Table 5 also aims to capture the wider global presence of LCA, lacking in the listing of established LCI databases. In no way does it attempt to be comprehensive, but rather aims to list organisations or institutions providing LCI data in countries not represented in any of the preceding tables. Table 6 provides a listing of LCA software because these are typically the primary way of accessing LCI databases.

Discussion and supporting information is provided for the tables, with that for the national-level databases primarily taken from the original version of this report. Short summary paragraphs of the industry/proprietary databases were requested from representatives of the database projects,

or taken from information sent by the representative with the "call for interest." If not supplied directly, information that is available via the internet from a source's respective website was used.

2 PUBLICLY-AVAILABLE DATABASE DEVELOPMENT EFFORTS AT THE NATIONAL LEVEL

2.1 AFRICA

With South Africa a major exporter of raw materials, the external demand for life cycle inventory data from South Africa is increasing [9]. There is increasing potential for greater coordination of LCA efforts in South Africa. Although a few South African universities and research institutes have been active in LCA for over ten years, South African industry and government have been slow to realise the benefit of LCAs.

In developing countries in general, LCA capacity is low, and interest from industry and government is typically also low. LCA activity is usually only at an academic or research institute level. As many of these countries supply resources to developed countries, there is increasingly the recognition that LCI databases need to include the products and services from developing countries.

2.2 APEC REGION AND ASIA

The need to develop a public LCA database with data applicable to the Asia Pacific region has been identified, and initial moves toward achieving this have been taken, driven largely by Japan. LCA activities in the region have been promoted by a series of symposia focusing on capacity building; the most recent meeting was held in Bangkok, Thailand, in December 2005 [10]. The need for an international LCA forum of APEC member countries was identified in these symposia, to encourage collaboration and to share LCA skills between developed and developing countries, with the ultimate aim of developing an international database for the region. An initial step has been to develop an LCA researcher's network [11], as a precursor to an LCA forum. In 2000, the Japan Environmental Management Association for Industry (JEMAI) launched a project with Australia, Indonesia, Korea, Malaysia, Singapore, Taiwan, and Thailand to exchange information and to develop LCI data in cooperation with these countries on energy and a few basic materials [12].

JAPAN

In Japan, progress in LCA has been significantly catalysed by the National LCA Project, which was started by the Ministry of International Trade and Industry (MITI) in October 1998. The project is run with the participation of industry, government, research institutions and academia, whilst JEMAI is the secretariat for the project. The project has developed a publicly available, reliable LCA database to advance LCA methodology and practice throughout Japan. [13]. LCI data for average Japanese production of a variety of materials are prepared by Japanese industrial associations, whilst calculations based on Input/Output tables, statistics, and process models are

used to fill in data gaps. The database is available via the web to parties who pay a required membership fee [14]. However, the database is released only in Japanese.

AUSTRALIA

In Australia, a number of research institutes, consultants and industry associations have developed LCI databases. However, as yet, only that developed under the auspices of the Australian Life Cycle Inventory Data Project (a collaborative effort by the Centre for Design at RMIT, the Centre for Water and Waste Technology at the University of New South Wales and the Cooperative Research Centre for Waste Management and Pollution Control) has been made publicly available. In this project Australian LCI data sets have been developed for various plastics, glass bottles, aluminium, steel, timber, paperboard, concrete, electricity and heat from various fuels, and a variety of transport processes. The data sets are developed from the best Australian data available, supplemented with information from overseas data sets where necessary. Reports from this project plus updated inventories are available on the internet [15]. LCA activities in Australia are becoming increasingly co-ordinated, with the establishment of the Australian LCA Society (ALCAS). ALCAS is currently in the process of developing a data collection protocol for a National LCI database which is planned to be hosted and supported by the Australian Commonwealth Scientific and Research Organisation (CSIRO).

KOREA

Korea has supported two LCI database construction projects; one is supported by the Ministry of Commerce, Industry and Energy (MOCIE) while the other is supported by the Ministry of Environment (MOE). Both projects were ended in 2003, producing about 250 LCI modules. Korea is now in the second phase of the LCI database projects; as of 2004, MOCIE and MOE have been updating the existing LCI databases as well as constructing additional LCI databases. As a result, Korea now has about 300 LCI modules which are being used for Korean Type III Environmental Declaration Program. From 2004, the Ministry of Construction and Transportation (MOCT) initiated the 3-year project to construct the national LCI databases mainly for the building & construction materials and processes. These databases will be used for the Green Building Certification Program [16].

TAIWAN

LCA programs in Taiwan have been underway during the past 10 years. The wide range of activities includes a multi-year project being conducted by the Industrial Technology Research Institute (ITRI) to develop an LCI database [11]. This project is funded by the country's Ministry of Economic Affairs. LCI efforts at ITRI through the year 2000 resulted in a substantial inventory of domestic LCI data, although as of December 2000, no critical peer review of the data had taken place [2]. The basic data and the results are available on the internet for access by the public. An LCA forum was organised by ITRI to share information, identify the gaps, build consensus among public and private sectors, and co-ordinate development efforts on LCA in the country [11]. ITRI has also developed an LCA software system named "Do-It-Pro" for the Taiwan domestic users [17].

INDIA

The Indian Society for Life Cycle Assessment (ISLCA) has been active for the past several years. The goal of the Society is to build capacity and interest in LCA within India [14].

THAILAND

LCA was introduced to the Thai industries in 1997. An LCA forum named “Thai LCA Network” was established by Chiang Mai University (CMU). The first formal LCI study was conducted by Thailand Environment Institute (TEI) in 2000 to develop LCI for Electricity Grid Mixes. Several LCI and LCA projects have been conducted by Cleaner Technology Advancement Program under the National Metal and Materials Technology Center (CTAP/MTEC) in collaboration with many universities and TEI since 2000. In 2005, Thai National LCI database project was established with the technical support from Japanese Government through Green Partnership Plan. MTEC is the core implementing organization of this 3-year project with the support from several partner organizations such as Federation of Thai Industry (FTI), Petroleum Institution of Thailand (PTIT), TEI, Ministry of Industry (MOI), Ministry of Natural Resources and Environment (MONRE), etc [18].

OTHER

In China, institutions and academia are conducting LCA-related research, with an emphasis on environmental evaluations of waste recovery options and energy systems [13]. A project, “Research on Materials Life Cycle Assessment,” supported by the National R&D program, has been underway for some time, and a National LCA Centre was established [3]. A national database is being developed in China. In Malaysia work is being done to develop LCI data for electricity production [19]. Activity in LCA is taking place at several universities in Vietnam, and the Federal Government has commissioned several LCA studies beginning in 1999 [13]. Input-output LCA is being conducted at the National University, Ho Chi Min City, and the Open University has a team working on process-based LCAs. Case study topics include energy systems, waste management systems, and an oil product. Some case studies have been carried out in Singapore, however use of LCA is not yet widespread. The government established the Environmental Management Standards Committee, which formed a focus group on LCA, discussing all aspects of LCA. The members are from the Ministry of Environment, Universities and National Research Institutes, as well as from industry [11]. Some case studies have been carried out in Indonesia, following national workshops introducing LCA to the country [11].

2.3 EUROPE

As the “power-house” of LCA since the late 1980’s, many different databases and data sources have been developed in Europe over the years. There are many university-based and consultancy-based databases which characterize particular industrial sectors and product groups. These are generally very diverse and fragmented, with a poor level of harmonisation, due to the many countries and many actors (industry, research, public authorities etc.) involved. For countries such as Germany, Sweden, and Switzerland, which have been active in LCI data development for a number of years, the current challenge is one of integrating and ensuring comparability and interchangeability of a wide variety of LCI databases.

GERMANY

The German network on LCI data was initiated in 2001 as a joint effort with the federal government in order to provide continuously updated and reviewed LCI data sets. The European Concerted Research Action - "Sustainable Materials Technology - Life Cycle Inventories for

Environmentally Conscious Manufacturing Processes," is an open framework for European co-operation in the field of LCA with more than twelve European countries participating, scheduled to last until June 2006. The main objective of this action is to bridge the gap between fundamental LCA research and the needs of industry for an operational framework and model.

SWEDEN

In 1996, the establishment of a quality reviewed Swedish national LCA database was started within the Swedish national competence center CPM (Center for Environmental Assessment of Product and Material Systems) [20]. The database, named SPINE@CPM, was launched to the public in 1998, and has since then been available through the Internet. All datasets published through the database are well-documented, and have been manually reviewed with regard to transparency and understandability.

SWITZERLAND

Swiss LCA activities intensified during the 1990's, in particular with the LCI data reference work on energy systems, material supply, transport and waste management services [21]. In the year 2000, the main LCA research institutes in the ETH domain and Swiss Federal Offices founded the ecoinvent Centre, the Swiss Centre for Life Cycle Inventories, which established an LCI database that covers commodities that are frequently used in LCA studies [22]. Transparent reporting is one of the key characteristics of the Swiss LCI database.

OTHER

Various European organisations and initiatives have facilitated exchange of LCA information over the years (e.g., SETAC-Europe, LCANET, CHAINET, etc.). A first attempt to facilitate the exchange of LCI data was done by SPOLD (Society for the Promotion of Lifecycle Development), which worked to develop a common format for the exchange of life-cycle inventory data [23]. In the beginning of this century the EcoSPOLD format was developed starting from SPOLD 99 and the ISO/TS 14048 data reporting format. Most commercially available LCA software (in particular CMLCA, EMIS, GaBi, KCL-eco, Regis, SimaPro, TEAM, and Umberto) are now able to import and partly even to export EcoSPOLD files. Most of the European databases that have been developed are only available through one of the many LCA software programs available (usually for a fee), with relatively few databases provided on a national, publicly available basis (see Tables 3 and 4).

In its communication on Integrated Product Policy (COM (2003)302), the European Commission concluded that Life Cycle Assessments provide the best framework for assessing the potential environmental impacts of products currently available. In the document, the need for more consistent data and consensus LCA methodologies was underlined. It was therefore announced that the Commission will provide a platform, called The European Platform of Life Cycle Assessment, to facilitate communication and exchange of life-cycle data and launch a co-ordination initiative involving both ongoing data collection efforts in the EU and existing harmonisation initiatives. The Platform is planned to provide quality assured, life cycle based information on core products and services as well as consensus methodologies. The project started in mid-2005 and is planned to run until mid-2008 [24].

2.4 AMERICAS

CANADA

The Canadian Raw Materials Database project was begun over 10 years ago, although it was only made publicly-available from 2001 until 2004. The database contains life cycle inventory cradle-to-gate data for basic materials, as provided by industry associations and their contractors. The data reflect as closely as possible Canadian production, except that in some cases the Canadian data have been averaged with US production data in order to protect proprietary information concerning Canadian suppliers. The materials covered include steel (EAF and integrated), aluminium, six separate plastics, glass (recycled and virgin), paper, and softwood lumber. The data were available in pdf format at no cost to the public. The website is still online but it has not been possible to access the data since 2004. The continuation of the project has not been determined.

USA

LCI data is available from a fair number of sources in the USA, from work done at various universities and research organisations, and by various government departments, consultants and industry organisations. However, not until 2001 was a collaborative project to develop a publicly available LCI database for the USA realized (more specifically, the database contains cradle-to-gate or gate-to-gate data that can be used in completing an LCI). This project received start-up funding from the General Services Administration (GSA) and the US Department of Energy (DoE), and the database is hosted by the National Renewable Energy Laboratory (NREL). The data, a user guide and project development guidelines can be downloaded from their website [25]. There are currently 73 data modules in the NREL database that are available for downloading.

LATIN AMERICA

There is much activity now occurring in Latin America on LCA. An LCI database development project for Argentina was launched at the Universidad Tecnológica Nacional (Mendoza), but due to the present economic situation in Argentina, there is no current funding for the project [26]. In Chile, work is being done to develop electricity data representative of Chilean conditions.

Professor Armando Caldeira Pires and his team are developing a Brazilian database, as well as conducting a South American project to develop a standardized LCI database for metals (although Mexico is not receiving funds for this project they are also participating). Colombia has also started a national LCI database. Mexico also started database development, first funded and helped by AIST in 2002, for electricity and metals, and then continued with other important sectors such as fuels, chemical substances, some building materials and waste treatment. Last year the Mexican Center for LCA and Sustainable Design was started; the Center now manages the databases, and is working together with government and industry to officially launch a project which will allow the database to grow [27].

TABLE 1: GLOBAL ACTIVITY IN THE PRODUCTION OF LCI DATA

<i>Level of Participation</i>	<i>Africa</i>	<i>APEC</i>	<i>Europe</i>	<i>Americas</i>	<i>Global</i>
<i>Multi-organisational and/or National or Multigovernment¹</i>		Australia, Japan, Korea, Singapore, Taiwan	Denmark, Sweden, Switzerland	Canada, USA	
<i>Consultants and Research Institutes (data made available)²</i>			Denmark, Netherlands, Norway, Sweden, Switzerland, Germany, Italy	USA	Boustead, TEAM GaBi, SimaPro
<i>Industry (data made available)³</i>		ISSF	PlasticsEurope (formerly APME), FEFCO, ISSF, Volvo, EPD-Norway, EAA	ISSF, APC	IISI, Nickel
<i>Decentralized (academic, consultants etc.)⁴</i>	Egypt, Mauritius, South Africa	China, India, Indonesia, Malaysia, Philippines, Thailand, Vietnam	Norway	Brazil, Chile, Colombia, Mexico	

1. Co-ordinated effort to produce nationally representative and accessible database. Typically involves collaboration between several organisations and some degree of government funding.
2. Inventories produced by research organisations or consultants and made publicly available in a database, most often for a fee (e.g. databases included with LCA software).
3. Inventories produced and published under the auspices of a particular industry organisation. Includes cases where data made only partially available (e.g. for a fee, or only to parties with sufficient motivation for requesting the data). Most often data compiled by consultants, but includes cases where LCI development is done in-house, or by academic or other research organisations.
4. Includes inventories compiled by academic or other research organisations, made either partially or fully available on an ad-hoc basis (e.g., through journal publications). Countries may have some degree of information sharing (e.g. an LCA society), but no co-ordinated data gathering effort (i.e. studies are not organised into an accessible database).

TABLE 2. LCA ORGANISATIONS

<i>Region</i>	<i>Name</i>	<i>Contact</i>	<i>Email</i>	<i>Website</i>
Africa	African LCA Network (ALCANET)	Toolseeram Ramjeawon	ramjawon@uom.ac.mu	http://ciclo-cycle.obiki.org/net/ALCAN.html
America	American Center for LCA (ACLCA)	Rita Schenck	rita@iere.org	www.lcacenter.org
APEC	LCA Researcher's Network for APEC Member Economies (APLCANET)	Karli James	karli.james@vu.edu.au auslcanet@rmit.edu.au	http://unit.aist.go.jp/lca-center/asianetwork/top.htm or http://aplcenet.rmit.edu.au/
Australia	Australian Life Cycle Assessment Society (ALCAS)	Karli James	Karli.James@rmit.edu.au	www.alcas.asn.au
Canada	CIRAIG	Daniel Normandin	daniel.normandin@polymtl.ca	http://www.polymtl.ca/ciraig/
Denmark	LCA Center Denmark	Jeppe Frydendal	info@lca-center.dk	www.lca-center.dk
India	Indian Society of LCA (ISLCA)	Prof. Vinod K. Sharma	vks@igidr.ac.in	members.tripod.com/neef.in/islca.html
Japan	LCA Society of Japan (JLCA)	Nakano Katsuyuki	nakano@jemai.or.jp	www.jemai.or.jp/lcaforum/
	Research Center for LCA	Atsushi Inaba	a-inaba@aist.go.jp	http://unit.aist.go.jp/lca-center/english/top.htm
	The Institute of LCA, Japan	Atsushi Inaba	a-inaba@aist.go.jp	http://ilcaj.sntt.or.jp/ (Japanese)
Korea	Korean Society for LCA (KSLCA)	Tak Hur	takhur@konkuk.ac.kr	kslca.com (Korean)
	LCA Research Center (LCARC)	Yong Woo Hwang	hwangyw@inha.ac.kr hwangyw@lcarc.re.kr	http://www.lcarc.re.kr/English/
Latin America	Association of LCA in Latin America (ALCALA)	<i>Nydia Suppen</i>	nsuppen@lcamexico.com	http://www.scientificjournals.com/sj/lca/Pdf/aId/7637
Mexico	Mexican Center for LCA and Sustainable Design	<i>Nydia Suppen</i>	nsuppen@lcamexico.com	http://www.lcamexico.com
Sweden	Center of Environmental Assessment of Product and Material Systems (CPM)	Peter Lysell	peter.lysell@cpm.chalmers.se	http://www.cpm.chalmers.se
Philippines ¹		Raymond Tan	tanr_a@dlsu.edu.ph	
Thailand	Thai LCA Network	Sate Sampattagul	sate@eng.cmu.or.th	http://www.thailca.net

Names in italics not "official" representative for the forum, but a person known to be involved in that country, e.g., the author of a paper.

¹ Steps were taken to set up a network involving the academic, government and other organisations. Projection is to establish such a network by late 2006.

TABLE 3: AVAILABLE NATIONAL LCI DATABASES

<i>Name</i>	<i>Contact</i>	<i>Email</i>	<i>Website</i>	<i>Avail- ability</i>	<i>Language</i>	<i>Data focus (if any)</i>	<i>Geographic coverage</i>	<i>Number of datasets</i>
Australian Life Cycle Inventory Data Project	Tim Grant	tim.grant@rmit.edu.au	http://www.cfd.rmit.edu.au/programs/life_cycle_assessment/life_cycle_inventory	Free	English		Australia	>100
BUWAL 250			http://www.umwelt-schweiz.ch/buwal/eng/	Fee or included with SimaPro	German, English, French	Packaging materials	Switzerland	
Canadian Raw Materials Database	Murray Haight	mehaight@fes.uwaterloo.ca	http://crmd.uwaterloo.ca/	Free	English, French	Raw materials	Canada	>10
DuboCalc	Joris Broers	j.w.broers@dww.rws.minvenw.nl	http://www.rws.nl/rws/bwd/home/www/cgi-bin/index.cgi?site=1&doc=1785	Upon request	top level in Dutch/underlying LCA data in English	Construction materials	Netherlands	>100
Dutch Input Output	Mark Goedkoop	goedkoop@pre.nl	www.pre.nl	Licence fee	English	Input-output	Netherlands	>100
ecoinvent	Rolf Frischknecht	frischknecht@ecoinvent.ch	www.ecoinvent.ch	Licence fee	English, Japanese, German		Global/ Europe/ Switzerland	>1000
Eco-Quantum					Dutch			
EDIP	Niels Frees	nf@ipu.dk	www.lca-center.dk	Licence fee	Danish, English, German		Denmark	>100
Franklin US LCI	Mark Goedkoop	goedkoop@pre.nl	www.pre.nl	Available with SimaPro	English		U.S.A	>10
German Network on Life Cycle Inventory Data	Christian Bauer	info@netzwerk-lebenszyklusdaten.de	www.lci-network.de	On-going	German, English		Germany	
ITRI Database			http://www.itri.org.tw		Taiwanese, English			
IVAM LCA Data	Harry van Ewijk	hvewijk@ivam.uva.nl	www.ivam.uva.nl	Licence fee	Chinese, English	Construction, food, waste, etc.	Netherlands	>1000

Japan National LCA Project	Nakano Katsuyuki	nakano@jemai.or.jp	http://www.jemai.or.jp/lcaforum/index.cfm (in Japanese) http://www.jemai.or.jp/english/lca/project.cfm	Fee	Japanese		Japan	>600
Korean LCI	Tak Hur	takhur@konkuk.ac.kr	http://www.kncpc.re.kr	On-going				
LCA Food	Per Nielsen	pn@ipl.dtu.dk	www.lcafood.dk	Free	English	Food products	Denmark	
SPINE@CPM	Sandra Häggström	sandra.haggstrom@imi.chalmers.se	www.globalspine.com	Fee	English	-	Global	>100
Swiss Agricultural Life Cycle Assessment Database (SALCA)	Thomas Nemecek	thomas.nemecek@fal.admin.ch	www.reckenholz.ch/doc/en/forsch/control/bilanz/bilanz.html	Free with contact	German	Agriculture	Switzerland	>100
Thailand LCI Database Project	T. (Rut) Mungcharoen	thumrong@mtc.or.th	www.mtc.or.th		Thai, English			
US LCI Database Project	Michael Deru	michael_deru@nrel.gov	www.nrel.gov/lci	Free with contact	English		US	73

TABLE 4: INDUSTRY ORGANISATION DATABASES

<i>Industry organisation</i>	<i>Contact</i>	<i>Email</i>	<i>Website</i>	<i>Avail- ability</i>	<i>Product group or sector</i>	<i>Geographic coverage</i>
American Iron and Steel Institute (AISI)	Bill Heenan or Jim Schultz	Bheenansri@aol.com jschultz@steel.org			Iron and steel	America
American Plastics Council (APC)	Mike Levy	Michael_Levy@amer icanchemistry.com			Polymers	America
EDP-Norway	Bjørn Sveen	Bjorn.Sveen@nho.no	www.epd-norge.no	Free	Norwegian business (several sectors)	Norway and Europe
European Aluminium Association (EAA)		eea@eea.net	www.aluminium.org	Free	Aluminium	Europe
European Copper Institute (ECI)	Ladji Tikana	lcc@kupferinstitut.de	www.copper-life-cycle.org	Free with contact	Copper	Europe
European Federation of Corrugated Board Manufacturers (FEFCO) Groupement Ondulé, European Association of Makers of Corrugated Base Papers (GEO) European Containerboard Organisation (ECO)	Angeline de Beaufort	beaulang@planet.nl	www.fefco.org	Free	Corrugated Board	Europe
International Iron and Steel Institute (IISI)	Lionel Aboussouan	aboussouan@iisi.be	www.worldsteel.org	Free with contact	Steel	Global
ISSF International Stainless steel Forum (ISSF)	Staffan Malm	malm@iisi.be	www.worldstainless.org/	Free with contact	Stainless steel	Global
KCL (EcoData)	Catharina Hohenthal- Joutsimo	Catharina.hohenthal- joutsimo@kcl.fi	http://www.kcl.fi/eco	Fee	Pulp and paper	Finnish/Nordic
Nickel Institute	Bruce McKean	BMcKean@nickelins titute.org	http://www.nickelinstitute.org/in dex.cfm/ci_id/114.htm	Free with contact	Nickel	Global
PlasticsEurope (formerly APME)	PlasticsEurope	info@plasticseurope. org	www.plasticseurope.org	Free	Plastics	Europe
Volvo EPDs			http://www.volvo.com/group/glo bal/en-gb/Volvo+Group/ourvalu es/environmentalcare/products/p roducts.htm	Free	Trucks and busses	Europe

TABLE 5: OTHER SOURCES OF LCI DATA¹

<i>Data provider (name of institution)</i>	<i>Data provider type</i>	<i>Contact</i>	<i>Email</i>	<i>Website</i>	<i>Avail-ability</i>	<i>Data focus (if any)</i>	<i>Geographic coverage</i>	<i>Number of datasets</i>
Group of Pollution Prevention (GP2), Chemical Engineering Department, University of Sao Paulo	Academia	Gil Anderi da Silva	ganderis@usp.br				Brazil	>10
Østfold Research Foundation	Research Institute	Cecilia Askham Nyland	cecilia@sto.no	www.sto.no			Norway and Europe	>100
SINTEF Byggforsk (The Norwegian Building Research Institute)	Research Institute	Sverre Fossdal	Sverre.fossdal@byggforsk.no	http://www.byggforsk.no/default.aspx?sp raak=en			Norway	

1. This table lists those data providers with available LCI data, but which are not in a well-organised and distributed database (such as those in Table 4). The table could thus potentially be large, so in no way does it attempt to be complete. It also includes those data providers that replied to a "call for interest" that was issued by the UNEP/SETAC Life Cycle Initiative managers on behalf of the database registry Task Force.

TABLE 6: LCA SOFTWARE

<i>Name</i>	<i>Contact</i>	<i>Email</i>	<i>Website</i>	<i>Availability</i>	<i>Language</i>	<i>Data focus (if any)</i>	<i>Geographic coverage</i>	<i>Number of datasets*</i>
BEES 3.0	Barbara Lippiatt	blippiatt@nist.gov	http://www.bfrl.nist.gov/oae/software/bees.html	Free with contact	English	Building materials and products	USA	200
Boustead Model 5.0			http://www.boustead-consulting.co.uk/products.htm	Licence fee	English		Global	
CMLCA 4.2	Reinout Heijungs	heijungs@cml.leidenuniv.nl	http://www.leidenuniv.nl/interfac/cml/ssp/software/cmlca/index.html	Licence fee only for commercial use	English		Europe	
eiolca.net	H. Scott Matthews	hsm@cmu.edu	www.eiolca.net	Free	English	Input-Output	USA	>100
EMIS	Fredy Dinkel	f.dinkel@carbotech.ch	www.carbotech.ch	Licence fee	English, German		Global	>1000
Environmental Impact Estimator	Wayne B. Trusty	wayne.trusty@athenasmi.ca	http://www.athenasmi.ca/tools/	Licence fee	English	Building materials and products	Canada, USA	>10
GaBi	Daniel Coen	d.coen@pe-europe.com	http://www.gabi-software.com/	Licence fee	English, German, Japanese		Global	>1500
GEMIS			http://www.oeko.de/service/gemis/en/index.htm		English, German		Europe	
GREET 1.7	Michael Wang	mqwang@anl.gov	http://www.transportation.anl.gov/software/GREET/index.html	Free	English	Transportation sector, energy sector	USA	>20
IDEMAT 2005		idemat@io.tudelft.nl	http://www.io.tudelft.nl/research/dfs/idemat/index.htm	Licence fee	English	Engineering	Netherlands	>100
KCL-ECO 4.0	Catharina Hohenthal-Joutsimo	Catharina.hohenthal-joutsimo@kcl.fi	http://www.kcl.fi/eco	Licence fee	English		Global	

LCAiT	Lisa Hallberg	lisa.hallberg@cit.chalmer.s.se	http://www.lcait.com/	Licence fee	English			
MIET			http://www.leidenuniv.nl/cml/ssp/software/miet/index.html					
AIST-LCA (JEMAI-LCA)	Kiyotaka Tahara	k.tahara@aist.go.jp	http://unit.aist.go.jp/lca-center/english/theme.html	Licence fee to JEMAI	Japanese		Japan	>500
Regis	Martin Kilga	martin.kilga@sinum.com	www.sinum.com	Licence fee	English, German, Japanese		Global	
Simapro	Mark Goedkoop	goedkoop@pre.nl	www.pre.nl	Licence fee	English, Japanese		Global	>1000*
TEAM			http://www.ecobalance.com/uk_team.php				Global	
Umberto	Jan Hedemann	j.hedemann@ifu.com	www.umberto.de	Licence fee	English, German, Japanese		Europe	*

* Additional datasets are available for an additional fee (i.e. in a compatible format)

REFERENCES

1. Norris, G. and P. Notten. *Current Availability of LCI Databases in the World, Working Draft 2a*. 2002.
2. van Hoof, G., et al., *SETAC Working Group: Data Availability and Quality, Subgroup 1: Driving Forces for Data Exchange Final Report*. 2001, SETAC- Europe.
3. AIST. *4th AIST workshop on LCA for APEC member economies: Capacity building in the region*. 2004. http://unit.aist.go.jp/lca-center/lca-activity/symposium/04_sympo/picture041026.html., Tsukuba, Japan.
4. Inaba, A., *Recent Progress of LCA Activities in Japan*. International Journal of Life Cycle Assessment, 2000. **5**(5): p. 255-260.
5. Yano, M., et al., *Current Activities of the National LCA Project in Japan*. International Journal of Life Cycle Assessment, 2000. **5**(5): p. 261-264.
6. Zakaria, Z., M. Hassan, and M. Awang, *Current Status and Needs for Life Cycle Assessment Development in Asian/Pacific Regions*. International Journal of Life Cycle Assessment, 1999. **4**(4): p. 191-194.
7. US EPA, *LCAccess*, www.epa.gov/ORD/NRMRL/lcaccess.
8. CIRAIG, *Analyse environnementale du cycle de vie des produits, procédés et services : Validation des processus existants et implantation en industries (Annexe D)*. 2004, École Polytechnique, Montreal, Canada. p. 37.
9. Brent, A.C., et al., *An Overview of the Status of Life Cycle Assessment and Engineering Research in South Africa*. International Journal of Life Cycle Assessment, 2002. **7**(3): p. 167-172.
10. MTEC (2005) *International Workshop on Capacity Building on Life Cycle Assessment in APEC Economies*, http://www.mtec.or.th/Th/course_seminar/detail/capec/Schedule.html.
11. Sagisaka, M., *LCA Activities in Asia: Summary of LCA Cooperation Programmes Supported by AIST*, in *ECP Newsletter No. 20*. 2002: JEMAI, Japan.
12. Sagisaka, M. and A. Inaba, *Sharing Life Cycle Inventory Data among Asian Countries*, in *IGPA Newsletter*, vol 5, no 2. 2003.
13. Inaba, A. and T. Kabayashi. *Proceedings of APEC/AIST Symposium, LCA for APEC Member Economies: Collaboration on LCA for basic materials and energy production*. . in *National Institute for Resources and Environment, AIST, MITI*. Tsukuba, Japan.
14. Inaba, A. and T. Grant, *AIST Workshop 'Gateway to Life Cycle Impact Assessment for APEC Member Economies'*. International Journal of Life Cycle Assessment, 2003. **8**(2): p. 62.
15. Royal Melbourne Institute of Technology (RMIT), http://www.cfd.rmit.edu.au/programs/life_cycle_assessment/life_cycle_inventory. 2003.
16. Hur, T., *Personal communication via email*, 31 January 2006.
17. Jeng, Y.I., *Toward Green Productivity through Eco-Design: Achievements and the Road Ahead*. IGPA Newsletter, 2004. **6**(1): p. 2-5.
18. Sampattagul, S., *Personal communication via email*, 1 May 2006.
19. Malakul, P., *National LCI database development in Thailand*, in *International Workshop on Capacity Building on Life Cycle Assessment in APEC Economies*. 2005: Bangkok, Thailand.
20. Carlson, R. and A.-C. Pålsson, *Establishment of CPM's LCA Database; CPM Report 1998:3*. 2000, Chalmers University of Technology, Göteborg, Sweden.

21. Frischknecht, R., et al., *Ökoinventare von Energiesystemen: Grundlagen für den ökologischen Vergleich von Energiesystemen und den Einbezug von Energiesystemen in Ökobilanzen für die Schweiz. 3. Gruppe Energie - Stoffe - Umwelt (ESU)*, P.S.I. Eidgenössische Technische Hochschule Zürich und Sektion Ganzheitliche Systemanalysen, Villigen, Bundesamt für Energie (Hrsg.), www.energieforschung.ch, Editor. 1996: Bern, Switzerland.
22. ecoinvent Centre, *ecoinvent data v1.2, Final reports ecoinvent 2000 No. 1-16*. ISBN 3-905594-38-2. 2005, Swiss Centre for Life Cycle Inventories, Dübendorf, CH, from www.ecoinvent.ch.
23. 2.-0 LCA Consultants, *SPOLD*, <http://www.lca-net.com/spold/>.
24. European Union. *European Platform on LCA*, <http://europa.eu.int/comm/environment/ipp/lca.htm>. 2006.
25. National Renewable Energy Laboratory. *US LCI Database*, <http://www.nrel.gov/lci>. 2006.
26. Curran, M.A., M. Mann, and G. Norris, *The international workshop on electricity data for life cycle inventories*. Journal of Cleaner Production, 2005. **13**(8): p. 853-862.
27. Suppen, N., *email communication*. 11 January 2006.

ACRONYMS

ACLCA	American Center for LCA
AISI	American Iron and Steel Institute
AIST	Agency for Industrial Science and Technology (Japan)
ALCALA	Asociación LCA de Latinamerica (Latin American LCA Network)
ALCANET	African LCA Network
ALCAS	Australian LCA Society
APEC	Asia Pacific Economic Co-Operation
APC	American Plastics Council
APME	Association of Plastic Manufacturers in Europe (now PlasticsEurope)
CIRAIG	Centre interuniversitaire de référence sur l'analyse, l'interprétation et la gestion du cycle de vie des produits, procédés et services (Interuniversity Reference Center for the Life Cycle Assessment, Interpretation and Management of Products, Processes and Services) (Canada)
CML	Institute of Environmental Sciences (Leiden University, the Netherlands)
CPM	Centre for Environmental Assessment of Product and Material Systems (Chalmers University of Technology, Gothenburg, Sweden)
CSIRO	Commonwealth Scientific Research Organisation (Australia)
DEAM	Data for Environmental Assessment and Management
ECO	European Containerboard Organisation
EDIP	Environmental Design of Industrial Products (Denmark)
EAA	European Aluminium Association
EIE	Environmental Impact Estimator (Athena Institute, Canada)
EPD	Environmental Product Declaration
EPS	Environmental Priority Strategies in Product Design (Sweden)
FEFCO	European Federation of Corrugated Board Manufacturers
GaBi	Gantzzliche Bilanzierung (Total Balance)
GEDnet	Global Type III Environmental Product Declarations Network
GEO	Groupement Ondulé (European Association of Makers of Corrugated Base Papers)
GSA	General Services Administration (USA)
ICDA	International Chromium Development Association
IERE	Institute for Environmental Research and Education
IISI	International Iron and Steel Institute
IMOA	International Mercury Owners Association
ISSF	International Stainless Steel Forum
IMSAT	Institute of Mining Sciences and Technology (Vietnam)
IPU	Institute for Product Development (Productudvikling)
ISLCA	Indian Society for LCA
ITRI	Industrial Technology Research Institute (Taiwan)
JEMAI	Japan Environmental Management Association for Industry
JLCA	LCA Society of Japan
KCL	Research Company for the Global Pulp and Paper Industry (Finland)
KNPCP	Korean National Cleaner Production Center
KSLCA	Korean Society for LCA
LCA	Life Cycle Assessment

LCI	Life Cycle Inventory
MGB	Mine and Geosciences Bureau (the Philippines)
MITI	Ministry of International Trade and Industry (Japan)
MOCIE	Ministry of Commerce, Industry and Energy (Korea)
MOCT	Ministry of Construction and Transportation (Korea)
MOE	Ministry of Environment (Korea)
NEDO	New Energy Development Organisation (Japan)
NiDI	Nickel Development Institute (The Nickel Institute)
NiPERA	Nickel Producers Environmental Research Association
NIRE	National Institute for Resources and Environment (Japan)
NREL	National Renewable Energy Laboratory (USA)
OECD	Organisation for Economic Co-Operation and Development
SALCA	Swiss Agricultural Life Cycle Assessment Database
SETAC	Society of Environmental Toxicology and Chemistry
SPINE	Sustainable Product Information Network for the Environment
SPOLD	Society for the Promotion of LCA Development
TEAM	Tool for Environmental Assessment and Management
TEI	Thai Environment Institute
UNEP	United Nations Environment Programme
US EPA	United States Environmental Protection Agency

APPENDIX: BRIEF DESCRIPTIONS

African LCA Network (ALCANET)

ALCANET is a regional network aiming to support the research process, to provide teaching and training activities, and to foster public understanding of LCA.

AIST-LCA

The development of AIST-LCA Ver.4, the LCA software was completed in 2005. This software includes new features that enable the evaluation of recycling technologies, more sophisticated inventory data analysis by adopting the stage concept, and adoption of LIME, the new lifecycle impact assessment method. The inventory data set that has already been loaded in the software was improved and expanded in number. The software is commercialized in November 2005 through JEMAI as “JEMAI-LCA.”

American Center for Life Cycle Assessment

The ACLCA (www.lcacenter.org) was formed in 2001. Its mission is to build capacity and knowledge of LCA. ACLCA is a part of the Institute for Environmental Research and Education (IERE).

American Iron and Steel Institute (AISI)

The North American steel industry is heavily involved in efforts to evaluate the life cycle impacts of steel products using internationally accepted methodologies. These studies integrate life cycle inventory data, life cycle impact assessments, and risk assessment into an overall life cycle evaluation. This life cycle impact assessment is currently being peer-reviewed and is being broadened from a site-specific to an industry-wide basis. The study addresses all relevant environmental issues, including resource depletion, for the full life cycle of a steel product from mining of raw materials through the manufacturing and use phases of the product and ultimate disposal or recycling of the material used in the product.

American Plastics Council (APC)

APC is collecting unit process data for all steps from raw material acquisition through production of resin or precursor. Inventory data for 9 polymers and 4 polyurethane precursors are being collected. The final data will be submitted to the US LCI Database.

Association of LCA in Latin America (ALCALA)

ALCALA was formed in April 2005 and a workgroup was established to determine different tasks for the Association to address. While ACLCA is still in the planning stage, the following topics are being discussed: objectives, adequate legal structure, communication and promotion.

Association for Plastics Manufacturing in Europe (APME): see PlasticsEurope

ATHENA: see Environmental Impact Estimator

Australian LCA Society (ALCAS)

ALCAS is a professional organisation for people interested in practice, use, development and interpretation of LCA. The purpose of the society is to promote and foster the responsible

development and application of LCA methodology in Australia and internationally with a view to making a positive contribution to Ecological Sustainable Development (ESD) and to represent the Australian LCA community in the international arena. It is a not-for-profit organisation with individual and corporate members from industry, government, academia and service organisation.

Australian Life Cycle Inventory Data Project

Life Cycle Inventory Data Research Program is a research program with the principal aim of developing Life Cycle detailed data inventory resources for Australia. Life Cycle Inventory (LCI) is the second stage of life cycle assessment, but it is often the most resource intensive stage, so the better general data which are available, the easier the LCI development becomes. The Centre for Design's LCA resources are published in spreadsheets, and are also available in the SimaPro LCA software. Most of the data currently developed by the Centre and provided to the public had been developed from secondary data.

BEES 3.0

Created by National Institute of Standards and Technology (NIST) Building and Fire Research Laboratory, the BEES (Building for Environmental and Economic Sustainability) software can be used for balancing the environmental and economic performance of building products. Version 3.0 of the WindowsTM-based decision support software, aimed at designers, builders, and product manufacturers, includes actual environmental and economic performance data for nearly 200 building products. BEES 3.0 can be downloaded free of charge from the NIST web site link (<http://www.bfrl.nist.gov/oea/software/bees.html>).

Boustead Model 5.0

Created by Boustead Consulting, the Boustead Model is an extensive database, in which data such as fuels and energy use, raw materials requirements, and solid, liquid and gaseous emissions are stored. It also includes software which enables the user to manipulate data in the database and to select a suitable data presentation method from a host of options.

BUWAL 250

The Bundesamt für Umwelt, Wald und Landschaft (BUWAL) inventory has been superseded by the ecoinvent database.

CIRAIG

CIRAIG (Centre interuniversitaire de référence sur l'analyse, l'interprétation et la gestion du cycle de vie des produits, procédés et services) was created in 2001 with the goal of joining the strengths of Quebec and Canadian universities in the field of Life Cycle Management (LCM) and Life Cycle Assessment (LCA) and making them available to companies and governments. The CIRAIG is also an official partner of the UNEP/SETAC Life Cycle Initiative.

CMLCA 4.2

Created by the Centre of Environmental Sciences (CML) at Leiden University, CMLCA (Chain Management by Life Cycle Assessment) supports the technical steps of LCA. It does not support the procedural aspects, like peer review, involvement of stakeholders, quality assurance and usefulness of LCA for the decision at stake. The program assumes that the user is aware of the

basic principles of LCA. Moreover, there is at present only a small manual and a limited help facility. This may, however, change in due time.

CPM (Centre for Environmental Assessment of Product and Material Systems)

The centre was established at Chalmers University of Technology in Gothenburg, Sweden, in 1996. LCA research at Chalmers started in 1990 with a study on packaging materials. Methodological issues (allocation, system boundaries, role of LCA in decision making) were pursued in the Product Ecology Project, a project coordinated by the Swedish Federation of Industries, where even other research organisations (CIT, IVL) participated as well as a large industrial group. Other areas where LCA research has been carried out over the years include LCA of buildings and building materials, LCA of sewerage systems, and the starting of a LCA database (SPINE). CPM's overall goals include: working for the prevention and reduction of product-related environmental impact; gathering and consolidating Swedish competence at a high level internationally in the area of sustainable product development; and responding to the needs of industry and the community in general for adapted methodologies and support functions for integrating sustainability considerations into decision-making processes that concern products and materials. Gathering data, quality assurance of the data, the development of tools, and the communication of results have the highest priorities.

CRMD

The Canadian Raw Materials Database (CRMD) is a voluntary project involving a cross-section of Canadian materials industries to develop a database profiling the environmental inputs and outputs associated with the production of Canadian commodity materials. The database uses the techniques of life-cycle inventory (LCI), consistent with the method of life-cycle assessment (LCA). The purpose of the database is to provide Canadian life-cycle inventory data: - to small and medium-sized manufacturers, converters, formulators and other users to support their voluntary efforts in improving the environmental performance of their products, consistent with principles of pollution prevention and – to participating industries to support their internal improvements. Industry associations are participating on a voluntary basis with Environment Canada as chair. Participating materials industries are: aluminum, glass, plastics, steel and wood.

Danish LCA Center: see LCA Center Denmark

Data for Environmental Assessment and Management (DEAM): see TEAM

DuboCalc-database

The Netherlands Ministry of Transport, Public Works and Water Management has created a database containing LCI data of construction materials which are used in civil works. Data included are secondary data, derived from other databases, brought together in a set to use with their software for designers.

Dutch Input Output database

Economic Input Output database can be used alone in hybrid LCA studies. The starting point was an overview of how the average consumer distributes spending over 350 categories, such as buying tomatoes, driving to work and maintaining the garden. A link was made between these categories and the economic sectors. The economic input output table was used to trace the trade

flows between these sectors. Foreign input/output tables for the OECD and non OECD regions were introduced to allow for tracing the impact of goods produced outside the Netherlands. The database is included in standard SimaPro versions (commercial and educational versions).

ECO: see European Containerboard Organisation

Ecoinvent Database v1.2

A reference work for life cycle inventory data including the areas of energy, building materials, metals, chemicals, paper and board, forestry, agriculture, detergents, transport services and waste treatment. Data are based on the production and supply situation in the year 2000. The datasets are available on the level of unit process raw data as well as on the level of cumulative results. The ecoinvent data v1.2 comprises more than 2700 datasets with global/European/Swiss coverage. About 1000 elementary flows are reported for each dataset, including emissions to air, water and soil, mineral and fossil resources and land use. Furthermore, several actual and widespread impact assessment methods, namely the cumulative energy demand, climate change, CML 2001, Eco-indicator 99, the ecological scarcity method 1997, EDIP 1997, EPS 2000 and Impact 2002+ are implemented. The ecoinvent data v1.2 is available together with EMIS, GaBi, Regis, SimaPro, and Umberto and is importable into CMLCA, KCL-eco, and TEAM.

Eco-Quantum

Eco-Quantum is a calculating tool on the basis of LCA which serves actors in the building sector with quantitative information on the environmental impact of buildings as a whole. The added value of Eco-Quantum in this context is the database with composition data of about 1000 building components.

EDIP database

The EDIP database contains a large number of LCI data and supports the EDIP LCA methodology. Some of the data are aggregated, but others exist as system-plans, which makes it easy to modify by, for example, changing the type of electricity into regional or marginal. The EDIP materials data are well updated, a part having the same origin as in other databases, but others like paper, wood/furniture, textiles and electronics are unique for EDIP. Data for production processes are generally older, but some are quite unique (e.g., data for machining processes). EDIP also contains data for recycling and waste treatment, and for a large number of transport processes (different types of trucks, ships, trains and flights under different utilization and transport modes). The database was developed from 1991 to 1996. Since then, two major updates have been made, one in 2001 and the latest in 2003. The EDIP database is available together with the GaBi software from the Danish LCA Center or directly from the software developer PE.

eiolca.net

Created by the Green Design Institute of Carnegie Mellon, this web site allows users to estimate the overall environmental impacts from producing a certain dollar amount of a commodity or service in the United States. The database first was made publicly available in 1999; since then two major and several minor updates have been conducted. In 2006, the website had its 800,000th “user” (i.e. user of the model, not web page hits). The web-based model provides rough guidance on the relative impacts of different types of products, materials, services, or industries with respect to resource use and emissions. The latest version is based on the 1997

industry benchmark input-output accounts compiled by the Bureau of Economic Analysis of the U.S. Department of Commerce. It incorporates emissions and resource use factors estimated for all 491 sectors of the U.S. economy, using publicly available electricity and fuel consumption data compiled by the U.S. Census Bureau, the U.S. Departments of Energy and Transportation, and environmental databases created by the U.S. EPA. The model estimates the following environmental effects:

- Conventional Air Pollutants Emission (CO, NO_x, PM₁₀, SO₂, VOC and Pb)
- Toxics Release Inventory (TRI) Emissions
- Greenhouse Gas Emissions
- Electricity and Fuel Use

Environmental Impact Estimator

Developed by the Athena Institute, the Estimator was prepared for architects, engineers and researchers to get LCA answers about conceptual designs of new buildings or renovations to existing buildings. The Estimator assesses the environmental implications of industrial, institutional, office, or both multi-unit and single-family residential designs. The Estimator incorporates the Institute's inventory databases that cover more than 90 structural and envelope materials. Released in 2002, it simulates over 1,000 different assembly combinations and is capable of modelling 95% of the building stock in North America. Athena has also developed databases for energy use and related air emissions for on-site construction of building assemblies; for maintenance, repair and replacement effects through the operating life; and for demolition and disposal.

EPD Norway

In Norway NHO established a Norwegian EPD-program in 2000, in line with ISO/TR 14025 and following R&D-projects. In 2002 the program was further formalized as a Foundation owned by NHO (Confederation of Norwegian Business and Industry) and BNL (Confederation of Norwegian Construction Industry). Representatives of the Federal Pollution Control Authority, the Directorate of Public Construction and Property, as well as from process, energy, and furniture industries are represented on the board, in addition to NHO and BNL. In addition to a close cooperation between the Scandinavian EPD-programmes, an international member organisation GEDnet (Global Environmental Declaration Network) has been founded. GEDnet has arranged several seminars especially aimed at developing countries on how EPDs etc are developed. Presently about 49 EPDs are presented on the registry.

European Aluminium Association (EAA)

The EAA was founded in 1981 to represent the aluminium industry in Europe. Its members are the European primary aluminium producers, the national associations representing the manufacturers of rolled and extruded products in 18 European countries, the Organisation of European Aluminium Remelters and Refiners (OEA) and the European Aluminium Foil Association (EAFA).

Inventory data for the semi-fabrication of aluminium are given for the rolling of aluminium sheet, the extrusion of aluminium profiles and the rolling of aluminium foil to different thickness. The basic input material for sheet or extrusion fabrication is primary or secondary aluminium ingot (i.e. rolling slab or extrusion billet). The output is the finished semi-fabricated

product, packaging included, ready for delivery to the customer. The datasets also include aluminium ingot production from the recycling of process scrap.

European Containerboard Organisation: see European Database for Corrugated Board Life Cycle Studies

European Copper Institute

The copper industry has responded to the market need for consistent and accurate data on copper production by developing up-to-date life cycle data for its tube, sheet and wire products. The information has been prepared in cooperation with recognised life cycle practitioners, using international methodologies (ISO standards), leading software (GaBi), and proprietary production data collected from across the copper industry. These data are now available through a variety of channels, including the Institute's website.

European Database for Corrugated Board Life Cycle Studies

The European Database for Corrugated Board Life Cycle Studies report contains descriptions of the production process of different grades of containerboard and corrugated board, methodology questions, and European average data for 2002 for consumption of raw materials, additives and water, data for emissions to air, water and waste data. The database may only be used for environmental studies regarding product development and improvement and the comparison of the entire system of corrugated board packaging with that of other materials. The database may not be used for comparisons between the production of primary fibre and recovered fibre based materials as such. Such a comparison can be prevented by applying the closed-loop approach that is described in the report. The report, a joint publication from FEFCO, GEO and ECO, can be downloaded free of charge from www.fefco.org (or order a hard copy). The database is updated regularly and to ensure its maintenance a reference group meets regularly.

European Federation of Corrugated Board Manufacturers: see European Database for Corrugated Board Life Cycle Studies

European Platform for LCA

The European Commission initiated the Platform for LCA mid-2005 with the intent of promoting life cycle thinking in business and policy making in the EU. The focus of the effort is on underlying data and methodological needs. The Platform is planned to provide quality-assured, life-cycle based information on core products and services as well as consensus methodologies (<http://lca.jrc.it>).

FEFCO: see European Federation of Corrugated Board Manufacturers

Franklin US LCI database

This database contains North American inventory data for energy, transport, steel, plastics, and processing. The data were collected by Franklin Associates, Ltd., a division of ERG (Eastern Research Group). The fully documented and licensed database is available from SimaPro.

GaBi 4

GaBi (Ganzliche Bilanzierung) is a tool for creating life-cycle-balances. GaBi supports the user with handling a large amount of data and with modelling of the product life cycle. GaBi calculates balances of different types and assists in aggregating the results. The contained data sets are based on the experience of cooperation with industry, patent and technical literature. It is one of the most extensive databases in the world. The software and the database are independent units. In addition to the standard databases (lean and professional), GaBi offers extension databases from different branches e.g., metals, renewable raw materials, building materials, intermediate products, energy carrier, textile processing and many more. Additional datasets are available on request.

GEO: see Groupement Ondulé (European Association of Makers of Corrugated Base Papers)

GEMIS

Global Emission Model for Integrated Systems (GEMIS) is an LCA program and database for energy, material, and transport systems. It is available at no cost (public domain). The basic version 1.0 of the computer program GEMIS was developed in 1987-1989 as a tool for the comparative assessment of environmental effects of energy. The GEMIS database offers information on fossil fuels, renewables, nuclear, biomass, and hydrogen. GEMIS includes the total life-cycle in its calculation of impacts (i.e. fuel delivery, materials used for construction, waste treatment, and transports/auxiliaries). The GEMIS database covers for each process

- efficiency, power, capacity factor, lifetime
- direct air pollutants (SO₂, NO_x, halogens, particulates, CO, NMVOC)
- greenhouse-gas emissions (CO₂, CH₄, N₂O, SF₆, all other Kyoto gases)
- solid wastes (ashes, overburden, FGD residuals, process wastes)
- liquid pollutants (AOX, BOD₅, COD, N, P, inorganic salts)
- land use.

GEDnet

The Global Type III Environmental Product Declarations Network, GEDnet, was established to encourage information exchange between Type III environmental product declaration system developers and to discuss key issues in development of systems. Representatives from Japan, Canada, Germany, Norway, Denmark, the Republic of South Korea, China, USA, and Sweden are participating in GEDnet.

German Network on Life Cycle Inventory Data

The German Network on LCI data was initiated in 2001 in a joint effort of the Federal Ministry for Education and Research and the research center Forschungszentrum Karlsruhe (FZK). The network aims to supply continuously updated and reviewed LCI data sets. Within a funded research project, data sets in core areas (metals, energy, transportation, and building materials) are supplied and methodological aspects are consistently harmonized. First outputs are expected in 2006. Within the network major German software and data providers as well as industrial and scientific stakeholders are organized to reach consensus and realize this novel infrastructure for LCI data supply.

GREET 1.7

Sponsored by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE), Argonne has developed a life cycle model called GREET (Greenhouse gases, Regulated Emissions, and Energy use in Transportation). The model covers production of various transportation fuels and vehicle technologies using the fuels. GREET includes more than 85 fuel production pathways and more than 70 vehicle/fuel technology options for evaluation. For this purpose, GREET contains extensive data for transportation fuel production and use in particular, and production and use of energy products in general. GREET was developed as a multidimensional spreadsheet model in Microsoft Excel. A graphic user interface (GUI) program was developed for users to interact with GREET model to conduct simulations. This public domain model is available free of charge for anyone to use. The first version of GREET was released in 1996. Since then, Argonne has continued to update and expand the model. The most recent GREET version is GREET 1.7 beta version. For a given vehicle and fuel system, GREET separately calculates: - consumption of total energy, fossil fuels, and petroleum; emissions of CO₂-equivalent greenhouse gases; and emissions of five criteria pollutants (VOC, NO_x, CO₂, SO_x, and PM₁₀).

Groupeement Ondulé (European Association of Makers of Corrugated Base Papers): see European Database for Corrugated Board Life Cycle Studies

IDEMAT 2005

IDEMAT is a powerful tool for material selections in the design process. IDEMAT provides a database with technical information about materials, processes and components in words, numbers and graphics, and puts emphasis on environmental information. With IDEMAT you can lookup and compare information about materials, processes or components and you also can let IDEMAT search for materials that match your criteria.

Indian Society of LCA (ISLCA)

ISLCA is an independent organisation for the establishment of LCA methodology and application in India. Furthermore, ISLCA addresses technical, scientific, social, political, and public health issues in environmental management. Since its inception, ISLCA has actively participated in various events, organisations, and publications.

International Iron and Steel Institute (IISI)

In 1996 IISI launched a comprehensive data collection project, known as the IISI Worldwide Life Cycle Inventory (LCI) Study for Steel Products - in order to gather the data necessary for initiating or participating in LCA's. This exercise has subsequently been updated for 1999/2000 data for steelmaking operations. An integral part of the project was the development of a common worldwide methodology for collating and evaluating steel product LCI data. Since this innovative project was completed the results have been communicated to external audiences undertaking LCA studies for steel-using products, and to steel producers active in benchmarking and in other environmental improvement programmes. An ongoing programme is underway at IISI to further improve the electronic database resulting from the study.

International Stainless Steel Forum (ISSF)

ISSF has undertaken a commitment to provide the best possible information to the industry stakeholders in the area of LCA, delivering transparent and authoritative data on the production of stainless steel from its raw materials. Raw material LCI data have been provided by ICDA, NiDI and IMO, using the same methodology and standards. The experience gained from the life cycle studies at Eurofer, and the IISI, has been extended in order to produce an LCI for global stainless steel. The datasets involved in this study cover major stainless producers in Europe, Japan, Korea, and North America with a focus on global averages for the production of austenitic and ferritic grades (flat products). The data collection phase also covered long products, duplex grades, and stainless steel from scrap and ore based steel making. The ISSF global LCI data for stainless steel products are available to LCA practitioners on request.

IPU

The Institute for Product Development is a non-profit organisation situated in the Technical University of Denmark which carries out industrial research and development of products, processes, manufacturing systems, and organisations. IPU co-manages the LCA Center Denmark.

IVAM LCA Data 4.1

The IVAM database is a database to be used for environmental life cycle assessment (LCA) with SimaPro software. The database is an integration of various public databases, such as APME and ETH, and data from individual case studies performed by IVAM. It consists of about 1500 processes, leading to more than 350 materials. The data can be used for LCA applications in various sectors. Next to general background processes it consists of foreground processes especially in the sectors of Building and Construction, Food and Waste management.

Japan National LCA Project

The purpose of the of the LCA National Project in Japan includes the development of (1) LCA methodology, (2) LCA database, for the whole of Japan, and (3) a network system which is easily operable by users, and also the application of the results of developments in the following fields: application to industrial production activities, application to marketing, reflection in Environmental Administration, and acceleration of LCA popularization. The Inventory Study Committee, the Database Study Committee and the Impact Study Committee have been set up. There are 22 industry groups participating in the project.

KCL

KCL conducts research in pulping and papermaking. Along with the KCL-ECO 4.0 software tool, KCL maintains EcoData which is a continuously updated LCI database primarily intended for life-cycle inventory calculations related to forest products. The data has been collected by using experts from various branches of industry together with publications and questionnaires. EcoData contains nearly 300 data modules covering the following sectors:

- energy production: back-pressure and condensation power plants using different fuels (BAT, average or low technology)
- chemicals manufacturing (pulp and paper chemicals)
- wood growth and harvesting operations for spruce, pine and birch

- pulp, paper and board mills (typical product specific processes based on Finnish/Nordic production technology)
- deinking processes for different printing papers and tissue papers
- printing
- waste management operations (paper incineration, landfill)
- plastics
- transport data for trucks, trains and ships, covering the transport of both raw materials and product

Korean LCI

The Korean National Cleaner Production Center (KNCPC) is constructing an LCI database for Korean industries with the support of Ministry of Commerce Industry and Energy. The database is based on the request from industries through a series of surveys and is accessible through KNCPC's website.

LCA Center Denmark

LCA Center Denmark is a knowledge center for LCA and the life cycle approach. The center promotes product-orientated environmental strategies in private and public companies by assisting them in implementing life cycle thinking. LCA Center Denmark is partly funded by the Danish Environmental Protection Agency and is managed by IPU, COWI and FORCE Technology - division for Energy & Environment (former dk-TEKNIK ENERGY & ENVIRONMENT).

LCA Food

The LCA Food Database website provides LCA data on basic food products produced and consumed in Denmark. The site covers processes from primary sectors such as agriculture and fishery through industrial food processing to retail and cooking. The site is linked with a database in the SimaPro software.

LCAit

LCAit was developed by CIT Ekologik in 1992. It was the first software for LCA with a graphical interface on the market. Since then, LCAit has been widely used for the environmental assessment of products and processes.

MIET 3.0

MIET (Missing Inventory Estimation Tool) was developed by CML. It is substantially improved over the previous version by using additional data sets and the most up-to-date data sources. In contrast to MIET 2.0, a less aggregated assessment of the environmental interventions associated with the production of commodities and services is possible. In MIET 3.0, 480 commodities and services are considered while in MIET 2.0, only 91 commodities and services are distinguishable. In addition, the environmental intervention database module has been improved and contains information on generation of 1344 environmental interventions. MIET 3.0 is incorporated in the latest version of the Simapro software of Pré Consultants and is available as a stand-alone software package from Enviro Informatica under the name CEDA 3.0 (Comprehensive Environmental Data Archive).

Nickel Institute

The Nickel Institute, whose members represent over 70% of current world production, generates and communicates knowledge required to support safe and sustainable production, use and reuse of nickel. It was established on January 1, 2004. The Institute provides a single membership and management structure for activities previously undertaken by the Nickel Development Institute (NiDI) and the Nickel Producers Environmental Research Association (NiPERA). NiPERA is an independently incorporated division of the Nickel Institute, continuing as a well-respected provider of peer-reviewed, published information on the human health and environmental science of nickel. The Nickel Institute continues the use-related technical work of NiDI, but focuses more on nickel issues related to stewardship and sustainable development, especially the generation and use of knowledge about the full life cycle impacts of nickel. The nickel database has been in place since 2001 and includes complete and open cradle-to-gate data.

PlasticsEurope

Formerly The Association for Plastics Manufacturing in Europe (APME), PlasticsEurope generates eco-profiles that are periodically updated in a databank and provide extensive information on the main types of plastics, from cradle to the production plant gate (as delivered ex-plant: powder or pellets). To prevent as far as possible any misunderstanding or misuse of the data, it is highly recommended to first read the methodology document published on the website. The area covered is Europe (data collected from the APME members' European plants). Data on the consumption and recovery of plastics used in the main application sector of packaging, building and construction, automotive and electric and electronics are published annually. Indicative data are also provided for typical European plastics conversion operations.

REGIS

REGIS, a product of Sinum AG, is an LCA software tool that was developed in close cooperation with the Swiss Association for Environmentally Conscious Management and has consistently applied this methodology regarding the handling of system boundaries. Regis is the most used software tool for corporate ecobalances and the improvement of the corporate environmental performance according to ISO14031 in the German speaking part of Europe. Regis works with the ecoinvent database.

SimaPro 6

SimaPro stands for "System for Integrated Environmental Assessment of Products." In addition to product assessment, its generic setup allows for expanded use to analyze processes and services as well. First released in 1990, SimaPro is a proven, reliable and flexible tool used by major industries, consultancies and universities; nearly a thousand user licenses have been sold in 50 countries. To get started, SimaPro comes inclusive of several inventory databases with thousands of processes, plus the most important impact assessment methods. PRé Consultants is reseller of the new ecoinvent database, an up-to-date database with 2500+ processes. The SimaPro software can be run in various languages (English US, English UK, Italian, Spanish, French, Danish, German and Dutch). Databases, help and manuals are only available in English. A fully Japanese version of SimaPro is available through the Japanese partner Yamatake.

SPINE@CPM

SPINE@CPM is the Swedish national LCA database developed and maintained by IMI, Industrial Environmental Informatics at Chalmers University of Technology for the Swedish national competence center CPM (Centre for Environmental Assessment of Product and Material Systems).

The database contains more than 500 well documented and manually reviewed datasets. The database is available in two versions: SPINE@CPM in the SPINE format, and LCI@CPM in the ISO/TS 14048 format, where the data has been translated into the ISO/TS 14048 format. LCI@CPM is a web portal for LCI information. The portal provides the possibility to: search for specific LCI-data in the database; purchase LCI-data sets; and, convert SPINE data sets into ISO/TS 14048 automatically. The portal also provides other tools for information management for LCA.

In the database you can find detailed information on all types of goods, transportation, electricity, heat and fuel production, raw material production for (e.g., polymers, metals, chemicals, and building materials) as well as some manufacturing processes such as metal processing, and waste management alternatives. Some of the data sets in the database are reported as full flow-charts where each included process or transport is separately stored in the database.

Swiss Agricultural Life Cycle Assessment Database (SALCA)

The SALCA database contains over 700 modules with agricultural and non-agricultural inputs, outputs and processes. The data stored are based on internal calculations and on data imported from the ecoinvent database. The materials/processes in the database include agricultural products (e.g., maize, soy bean, wheat etc.), production processes (e.g., sowing, tillage etc.) and means of production (e.g., machinery, feed, fertiliser etc.), and food (e.g., milk, meat, potatoes etc.) plus ecoinvent data about material and energy flows. Apart from calculations done specifically for SALCA, inventories were calculated from the results of various LCA studies. The current version is SALCA 061 (2006). SALCA has been integrated in a database with help of the LCA software TEAM. Access to the SALCA database may be granted within a cooperation with Agroscope FAL Reckenholz. FAL also provides templates for LCA calculations of farms or crops.

Thai LCA Network

The Thai LCA Network was formed in 2000. It is a web-based forum to disseminate information and promote collaboration on LCA.

Thai National LCI Database Project

The Thai National LCI Database project is a 3-year project starting from 2005 with the aim of developing LCI database for Thailand with partial technical support from Japanese government through the Green Partnership Plan.

Tool for Environmental Assessment and Management (TEAM)

TEAM is Ecobilan's LCA software that allows users to build and use a large database and to model any system representing the operations associated with products, processes and activities. TEAM enables users to describe any industrial system and calculate the associated LCI and

potential environmental impacts according to the ISO 14040 series. TEAM comes with a Starter Kit database of over 300 modules to use in the construction of almost any system. These modules cover the range from fuel production to transportation and from chemical production to plastic molding. The modules provided in the Starter Kit are a subset of those available in the Ecobilan Group's general catalogue of data, referred to as DEAM (Data for Environmental Assessment and Management).

Umberto

Created by ifü Hamburg GmbH, Umberto serves to visualize material and energy flow systems. Data are taken from external information systems or are newly modeled and calculated. Graphic interface allows complex structures to be modeled: the production facilities in a company, process and value chains, or product life cycles. Flows and stocks can be valued using standard or individual performance indicators. Scaling per unit of products or per period is possible. Based on the material and energy flows the real costs of processes, materials being used, or waste materials that have to be disposed can be analyzed and displayed. The user can create individual projects with each project characterized by a freely definable and expandable list of products, raw materials, pollutants, forms of energy, etc. - all referred to as materials. They are administered in a hierarchically structured material list.

US LCI Database Project

In May 2001, the National Renewable Energy Laboratory (NREL) and its partners created the U.S. Life-Cycle Inventory (LCI) Database to provide support to public, private, and non-profit sector efforts to develop product LCAs and environmentally-oriented decision support systems and tools. Since the goal is to make the creation of LCIs easier, rather than carry out full product LCIs, database modules provide data on many of the processes needed by others for conducting LCIs. Therefore, the modules do not contain data characterizing the full life cycles of specific products. The database provides cradle-to-gate or gate-to-gate data, depending on the product or process, for commonly used materials, products and processes following a single data development protocol consistent with international standards. The resulting consistent and coherent LCI datasets for basic processes make it easier to perform life cycle assessments, and increase the credibility and acceptance of the results. The data protocol is based on ISO 14048 and is compatible with the EcoSpold format. The data are available in several formats: a streamlined spreadsheet, an EcoSpold format spreadsheet, an EcoSpold XML file, and a detailed spreadsheet with all the calculation details.

Volvo Environmental Product Declarations (EPDs)

Volvo reported production-related environmental data for the years 1995 to 1998 and evaluated the impact of its production plants on the greenhouse effect, air quality, acidification and ozone depletion. The site provides a chart for each one of these impact categories displaying the environmental impact for each year.